BY: Infinity Supercritical Staff EG TAGS: Supercritical CO2 Oil Extraction, Cannabis, Oil Concentrates

Optimization and characterization of marihuana extracts obtained by supercritical fluid extraction

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Source Review:

Authors:
Omar, J., Olivares, M., Alzaga, M., & Etxebarria, N. (2013).

Title:

Optimization and characterization of marihuana extracts obtained by supercritical fluid extraction and focused ultrasound extraction and retention time locking GC−MS

Journal of Separation Science, 36(8), 1397 -1404.

Several monoterpenes and sesquiterpenes are responsible for the unique and strong smell of the cannabis plant.

Terpenes are compounds in a group of naturally occurring volatile unsaturated hydrocarbons built off of isoprene which has the molecular C5H8, with monoterpenes having the structure C10H16 and sesquiterpenes having the structure C15H24.

While sesquiterpenes are in lower amounts in the buds of the cannabis plant, through drying the plant gives off a greater loss of monoterpenes, which would mean most of the smell of the plant while drying is from the monoterpenes.

Monoterpenes are mostly unstable and thus can be easily altered or destroyed in many normal extraction techniques, which has led to much focus on using supercritical fluid extraction (SFE) with CO2 to extract them.

Terpenes are miscible in CO2 at low temperatures and pressures while many non-volatile compounds (like cannabinoids) are not, which mean they can be extracted separately.

Due to these miscibility differences, two different optimal extraction parameters were found when trying to optimize the extraction yield for terpenes or for cannabinoids.

The extraction parameters investigated included pressures between 100 bar (1450psi) and 250 bar (3626 psi), temperatures between 35 (95 F) and 55 C (131 F), flow of solvent between 1-2 ml/min (extracting 100mg of plant matter), and addition of ethanol as a cosolvent between 0 and 40 percent by weight.

In reference to terpenes, temperature and ethanol percentage were significant, with low temperature and no ethanol being the best conditions.

In reference to cannabinoids, only ethanol percentage was found to be significant, with mild ethanol percentages being found to be most efficient.

Due to the insignificance of the other factors, 100 bar (3626 psi), 35 degrees Celsius (95 F), and a solvent feed of 1 ml/min are both optimal for terpenes and for cannabinoids, while 0 percent of ethanol is best for terpenes and 20 percent is best for cannabinoids.

It was also found that different cannabis strains had different concentrations of cannabinoids and terpenes.

For example, Critical and Amnesia are richer in cannabinoids than Somango, AK-47 and 1024.

Also in respect to terpenes, Critical species had the highest concentrations of alpha-pinene and beta-pinene and Amnesia has the highest concentrations of limonene.

Out of all the five species, five monoterpenes, twelve sesquiterpenes, and eight cannabinoids were able to be positively identified and quantified.

The separate extraction of terpenes and cannabinoids is important because terpenes contain their own therapeutic benefits and thus can be used without the psychotropic effects of the cannabinoids.

The optimal conditions mean one could extract all the terpenes first and then flush the system with ethanol to extract all the cannabinoids without changing the other parameters. To back this up, in a subsequent extraction as detailed above, all of the monoterpenes were found in the no ethanol extraction and only contain trace amounts of three of the eight cannabinoids.

The study also investigated the optimal extraction parameters of using focused ultrasound extraction with isopropanol and cyclohexane and found the best conditions for overall extraction were 3 s^(-1) cycles, 80 percent of amplitude on the sonicator, 5 minutes of sonication time with a 1:1 mixture of isopropanol and cyclohexane.

While this extraction yielded slightly more overall extraction than the SFE, it didn’t allow for the selectivity of the terpenes and the cannabinoids.

Thus it is recommended that SFE CO2 is used for cannabis extraction's due to the minimal difference in yields, the selectivity it offers, the food-safe nature of it, and the low-flammability of the solvent.

